



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/553,584	10/17/2005	John S. Althaus	19662-0033US1	1519
26181 7590 12/01/2009 FISH & RICHARDSON P.C. PO BOX 1022 MINNEAPOLIS, MN 55440-1022			EXAMINER DIETERLE, JENNIFER M	
			ART UNIT 1795	PAPER NUMBER
			NOTIFICATION DATE 12/01/2009	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATDOCTC@fr.com

Office Action Summary	Application No. 10/553,584	Applicant(s) ALTHAUS ET AL.	
	Examiner Jennifer Dieterle	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 and 46-53 is/are pending in the application.
- 4a) Of the above claim(s) 1-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 46-53 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/17/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status of the Claims

Claims 1-13 and 21-26 have been withdrawn.

Claims 14-20, 27-45, and 54-65 have been canceled.

Claims 46-53 are being examined.

Election/Restrictions

1. Applicant's election without traverse of Group III, claims 46-53 in the reply filed on 10/1/09 is acknowledged.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 52 and 53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear from the claim and from applicant's specification how the electrochemical signals are substantially free of guanine as guanine is a part of DNA.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 1795

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 46 and 47 are rejected under 35 U.S.C. 102(e) as being anticipated by Ito (US 2002/0155477 A1).

Regarding claim 46, Ito teaches an electrochemical method for detecting DNA hybridization (i.e. a target polynucleotide) comprising obtaining a first electrochemical signal from a first amount of probe molecule (paragraph [0014]) in the presence of a first polynucleotide and a second polynucleotide, the first and second polynucleotides being sufficiently complementary to form a duplex (paragraph [0041, 0085]) and then subjecting the first and second polynucleotides to a heating step in the presence of the first amount of probe molecule (paragraph [0081]) and obtaining a second electrochemical signal from the probe molecule.

Regarding claim 47, Ito teaches obtaining an electrochemical signal at a temperature below the melting point of the duplex (paragraph [0081, 0085]). Ito teaches that binding forces vary according to temperature and double-stranded DNA can dissociate into single-stranded DNA at temperatures beyond a certain temperature. The specific temperature is unique for each probe (paragraph [0003]). Ito then teaches that the temperature of the can be set and controlled by a controller and the

Art Unit: 1795

temperature and that the device performs measurements up to the optimal unique specific temperature (i.e. melting point) of the duplex (paragraph [0091, 0095, 0104]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 2002/0155477 A1) in view of Mathies et al. (US 6,132,580).

Regarding claim 48, Ito teaches an electrochemical detection means for genes (i.e. DNA, polynucleotides), but does not specifically teach performing at least one amplification step between the first measurement of the duplex and the measurement of the duplex after a heating step. Ito does teach a device comprising a temperature control unit with the capability to heat and cool a sample (paragraph [0041]). While Ito does not specifically use the term amplification, Polymerase chain reaction (PCR) is a well known technique to amplify DNA across several orders of magnitude based and can be based on the thermal cycling, consisting of cycles of repeated heating and cooling of the reaction for DNA melting and enzymatic replication of the DNA. PCR can be extensively modified to perform a wide array of genetic manipulations.

As noted in applicant's specification at section [0106]), Mathies et al. teach PCR amplification. Mathies et al. teach for the detection of chemical reactions and that PCR requires repeated cycling through a number of specific temperatures to carry out the melting, annealing, and ligation steps which are part of the process (col. 1, lines 18-40). Mathies et al. teach that the cycle of denaturation, hybridization, and extension is repeated as many times as necessary to obtain the desired amount of amplified nucleic acid. (col. 2, lines 66-67, col. 3, lines 1-30).

Therefore, it would have been obvious to one skilled in the art to modify the method of detecting in Ito to include an amplification step, between the initial detection

Art Unit: 1795

step and the heating step, such as PCR as taught by Mathies et al. because an amplified DNA allows isolation of DNA fragments for analysis.

5. Claims 49 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 2002/0155477 A1) in view of Alvarez et al. (*New Scheme for electrochemical detection of DNA based on electocatalytic oxidation of NADH*, Electrochemistry Communications, 5, 2003, pages 267-271).

Regarding claims 49 and 50, Ito teaches an electrochemical detection means for genes (i.e. DNA, polynucleotide), but does not specifically teach contacting the electrode with a liquid prior to obtaining a first electrochemical signal.

Alvarez et al. teach an electrochemical DNA biosensor in which the electrode is modified with oligonucleotides, (i.e. probe), is dried and then contacted with water prior to obtaining a first signal (page 268(section 2.2)).

Therefore, it would have been obvious to one skilled in the art to modify the treatment of the electrode in Ito by contacting the dry electrode with a liquid prior to obtaining a first electrochemical signal as taught by Alvarez et al. because providing a dry electrode will eliminate interference and will provide for enhanced hybridization detection.

6. Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 2002/0155477 A1) in view of (Duong et al. US 6,740,518 B1).

Regarding claim 51, Ito teaches an electrochemical biosensor, but does not specifically teach that the probe molecule is substantially free of polynucleotide having a length of at least 8 bases.

It is known that the point of attachment to the base will vary with the base. Duong et al. teach it is known that generally, attachment of at any position is possible. Thus, for example, generally attachment is to the 5 or 6 position of pyrimidines such as uridine, cytosine and thymine. For purines, such as adenine and guanine, the linkage is preferably via the 8 position (col. 29, lines 45-60). Therefore, depending on the analyte of interest, the probe can be selected to comprise the desired number of bases.

Therefore, it would have been obvious to one skilled in the art to modify the probe molecule in Ito to be any length *except* 8 bases as taught by Duong et al. because the selection of the probe molecule coincides with the length of bases and selecting a probe molecule with 5 or 6 bases will help to eliminate the effects of purines and guanine which preferably links via the 8 position.

7. Claims 52 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito and Duong et al. in view of Mascini et al. (*DNA electrochemical biosensors*, J. Anal. Chem., 2001, 369, pages 15-22).

Regarding claims 52 and 53, Ito, in view of Duong et al., teach an electrochemical biosensor in which the probe molecule is substantially free of polynucleotide having a length of at least 8 bases which inherently would make the

Art Unit: 1795

sensor free of purines and guanines since they are linked preferably via the 8 position.

Ito does not specifically teach that the reaction is free from contribution of guanine.

Mascini et al. teach a biosensor that utilizes an Ag/AgCl reference electrode (page 16) as does applicant's specification at section [0016]. Mascini et al. teach that at a voltage of +1 guanine base is oxidized (i.e. guanine oxidation peak). Inherently, the voltage can be varied as to not provide for the guanine oxidation peak. Applicant's in their specification state at section [0015-16] that an electrochemical signal may be substantially free of a portion arising from an oxidation or reduction of guanine residues, if present, of the target polynucleotide by having the first and second electrochemical signals arise from the application of a potential difference between a working electrode and a reference electrode. The potential difference may be between -1.2 V and 0 V as against a Ag/AgCl reference electrode.

Therefore, it would have been obvious to one skilled in the art to modify the voltage applied in Ito to fall within a range that is outside of the guanine oxidation peak which is around 1V as taught by Mascini et al. because by utilizing a voltage outside of the peak guanine oxidation range will help to avoid interference by guanine in the electrochemical measurement.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer Dieterle whose telephone number is (571) 270-

Art Unit: 1795

7872. The examiner can normally be reached on Monday thru Friday, 8am to 5pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

JMD
11/19/09